

# Preface

The earth's sustainable development is threatened by energy exhaustion and rising atmospheric concentrations of carbon dioxide linked to global warming. One of the causes for energy crisis and increased atmospheric carbon dioxide could be the imbalance between the rapid consumption of fossil fuels in anthropogenic activities and the slow formation of fossil fuels. An efficient method for counteracting the imbalance in the carbon cycle should involve the rapid conversion of biomass and organic waste into fuels and chemicals. For this purpose, we can learn from the geologic formation of fossil fuels. It is known that hydrothermal reaction plays an important role in forming petroleum, natural gas, and coal from organic wastes, and thus can be recognized as another pathway in the carbon cycle.

Hydrothermal reaction is generally defined as a reaction occurring in the presence of an aqueous solvent at high temperature and high pressure. The application of hydrothermal reaction to the conversion of biomass, as a relatively new technology, is receiving increasing attention. It has been demonstrated that the hydrothermal conversion of biomass shows excellent potential for the rapid conversion of a wide variety of biomass into fuels and/or value-added products. It is because high-temperature water exhibits very different properties from ambient liquid water and is environmentally friendly due to the nature of the reaction medium, i.e., water. Thus, if the geologic formation of fossil fuels in nature could be combined with the hydrothermal methods being studied for biomass conversions, an efficient scheme could be realized to recycle carbon and produce fuels and/or chemicals.

This book compiles recent advances in hydrothermal conversion of biomass into chemicals and/or fuels and consists of 15 chapters. It introduces the properties of high-temperature water, the merits of hydrothermal conversion of biomass, and some novel hydrothermal conversion processes, such as hydrothermal production of value-added products (with an emphasis on the production of organic acids), hydrothermal gasification, hydrothermal liquefaction, and hydrothermal carbonization. A wide range of biomass and biomass waste is involved in this book, from carbohydrates, lignocelluloses, and glycerine, to bio-derived chemicals and sewage sludge.

This book will help readers to expand their knowledge of biomass conversion and the carbon cycle, and facilitate understanding of how the problems associated with biomass conversion, shortage of energy, and the environment, can be solved.

It is the editor's hope that materials compiled in this book will be useful in conveying a fundamental understanding of hydrothermal conversion of biomass in the carbon cycle so that a contribution can be made to achieving sustainable energy and environment.

Fangming Jin

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Conversion

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